A2ALOG 10
6R66-A
.1

A2 ALOG 10 1966R66-A
eport on the Application Regarding the
emoval of Propane From the Provin 1
3 3398 00140 2170

LEGISLATURE LIBRARY
DEC 23 1974
C1
LIBRARY
VAULT 19

OGCB 66-A

REPORT ON THE APPLICATION REGARDING THE REMOVAL OF PROPANE FROM THE PROVINCE BY PACIFIC PETROLEUMS LTD. UNDER THE GAS RESOURCES PRESERVATION ACT, 1956

JANUARY, 1966

OIL AND GAS CONSERVATION BOARD
603 SIXTH AVENUE SOUTH WEST • CALGARY, ALBERTA

REPORT ON THE APPLICATION REGARDING THE REMOVAL OF PROPANE FROM THE PROVINCE BY PACIFIC PETROLEUMS LTD. UNDER THE GAS RESOURCES PRESERVATION ACT, 1956

JANUARY, 1966

OIL AND GAS CONSERVATION BOARD
603 SIXTH AVENUE SOUTH WEST • CALGARY, ALBERTA

PRICE $1.00 (Sales Tax Included)

TABLE OF CONTENTS

Section		Page
I	INTRODUCTION..................................	1
	Application	2
	Hearing and Appearances	2
	Qualification of Applicant	2
	Date of Reserve Assessment and Period of Protection	3
II	SUBMISSION OF PACIFIC PETROLEUMS LTD........	4
	Application	4
	Reserves of Propane	4
	Year by Year Availability of Propane	6
	Demand for Propane	7
	1. Alberta Requirements	
	2. Other Requirements	
	Surplus	9
	Summary	11
	Butanes	12
III	FINDINGS......................................	12
	1. In the Matter of the Recoverable Reserves and the Year by Year Availability of Propane in Alberta	12
	2. In the Matter of the Trends in Exploration and the Growth of Recoverable Reserves and Year by Year Availability of Propane in Alberta	14
	3. In the Matter of the Present and Future Requirements of Alberta for Propane and the Present Permit Commitments	14
	4. In the Matter of the Meeting of the 1966-1995 Requirements of Alberta, together with the Present Permit Commitments and the Resulting Surplus	15

Section | Page

5. In the Matter of Pacific Petroleums Ltd.'s Request for Authorization for the Removal of Propane and the Surplus which would Result if a Permit is Granted 16

6. In the Matter of the Disposition of the Application of Pacific Petroleums Ltd. 18

APPENDIX A.................................... A-1

The Present and Future Production and the Reserves of Propane in the Province of Alberta

APPENDIX B.................................... B-1

Alberta Propane Requirements and Permit Commitments

APPENDIX C.................................... C-1

The Meeting of the Present and Future Requirements of Alberta for Propane and the Existing Permit Commitments, and the Resulting Surplus

APPENDIX D.................................... D-1

The Applicant's Request for Authorization for the Removal of Propane and the Surplus which would Result if the Request was Approved

APPENDIX E.................................... E-1

Form of Permit

LIST OF TABLES

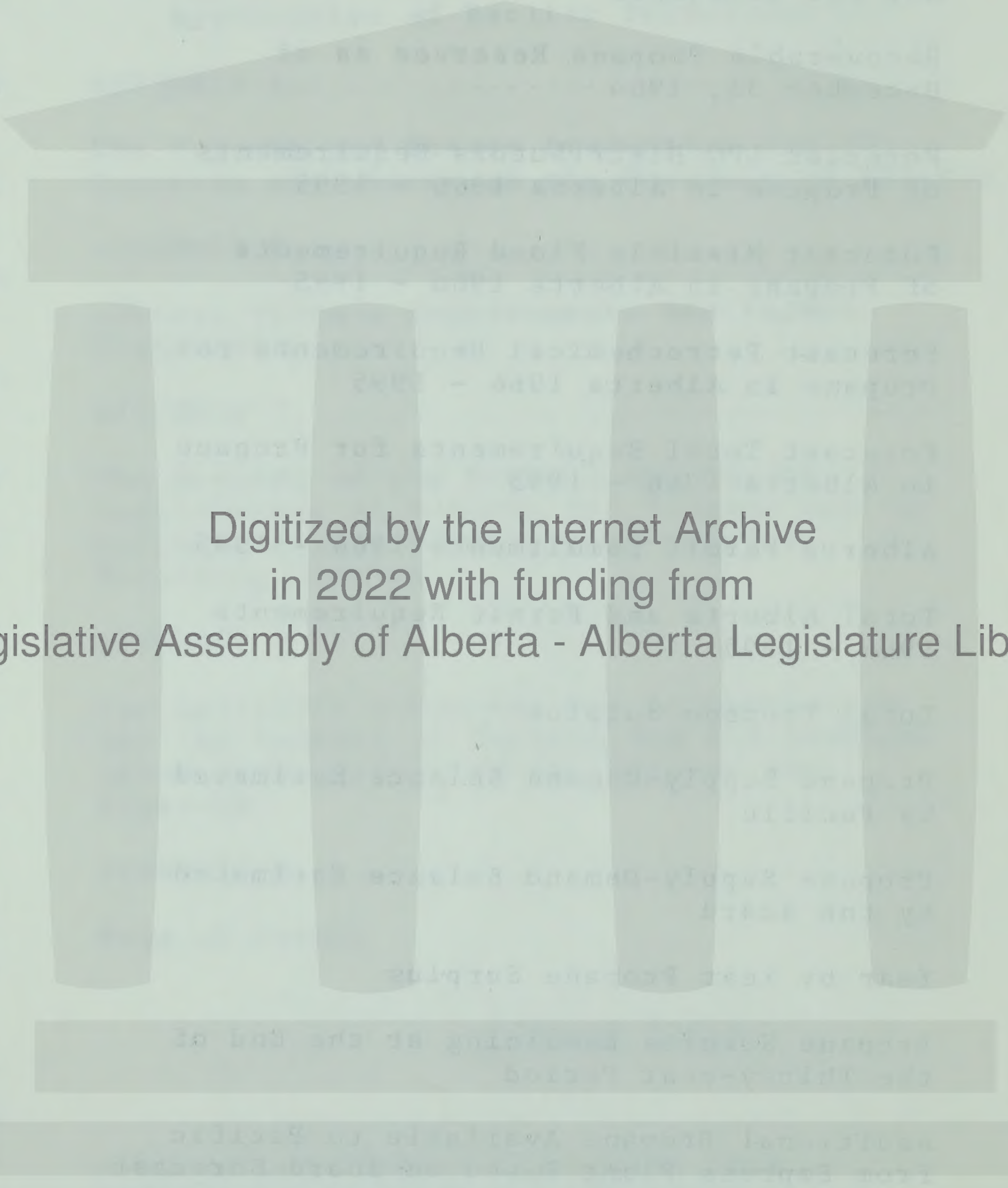
Table | Page

A-1 Forecast of Propane Production from Established Gas Reserves Based on Existing Plant Facilities A-16

A-2 Forecast of Propane Production from the Empress Plant A-17

A-3 Forecast of Additional Propane Production from Established Gas Reserves and Future Processing Facilities A-18

Table		Page
A-4	Forecast of Propane Production from Established Gas Reserves Including Future Processing Facilities	A-19
A-5	Forecast of Propane Production from Established Gas Reserves and Gas Reserves Not Yet Developed	A-20
A-6	Recoverable Propane Reserves as of December 31, 1964	A-21
B-1	Forecast LPG Distributors Requirements of Propane in Alberta 1966 - 1995	B-9
B-2	Forecast Miscible Flood Requirements of Propane in Alberta 1966 - 1995	B-10
B-3	Forecast Petrochemical Requirements for Propane in Alberta 1966 - 1995	B-11
B-4	Forecast Total Requirements for Propane in Alberta 1966 - 1995	B-12
B-5	Alberta Permit Commitments 1966 - 1995	B-13
B-6	Total Alberta and Permit Requirements 1966 - 1995	B-14
C-1	Total Propane Surplus	C-5
C-2	Propane Supply-Demand Balance Estimated by Pacific	C-6
C-3	Propane Supply-Demand Balance Estimated by the Board	C-7
C-4	Year by Year Propane Surplus	C-8
C-5	Propane Surplus Remaining at the End of the Thirty-year Period	C-9
D-1	Additional Propane Available to Pacific from Empress Plant Based on Board Forecast	D-6
D-2	Propane Surplus if Adjusted Pacific Request was Granted Based on Board Forecast	D-7
D-3	Propane Surplus Remaining at the End of the Thirty-year Period Based on Board Forecast	D-8
D-4	Propane Available to Pacific Based on Board Forecast	D-9



Digitized by the Internet Archive
in 2022 with funding from
Legislative Assembly of Alberta - Alberta Legislature Library

https://archive.org/details/ableg_33398001402170

I INTRODUCTION

Pacific Petroleums Ltd. (hereinafter called "Pacific"), by Application No. 2577, requested an order of the Oil and Gas Conservation Board varying and amending Permit No. PP 62-1. The permit was issued on August 14, 1962, pursuant to The Gas Resources Preservation Act, 1956, and authorizes Pacific to remove from the Province propane and butanes obtained from the processing, in its Empress plant, of gas belonging to Trans-Canada Pipe Lines Limited, during the term, in the volumes and subject to the terms and conditions, all set out in the permit.

The Gas Resources Preservation Act, 1956, provides that the Board shall not grant a permit for the removal of propane from the Province unless in its opinion it is in the public interest to do so having regard to the present and future needs of persons within the Province and the established reserves and the trends in growth and discovery of reserves of propane in the Province. These matters to which the Board must have regard were fully discussed in a recent report of the Board.(1) Consequently a complete review of these matters for the purpose of this report is not necessary. The recent report will be frequently referred to herein as "the September report". The Pacific application was filed within a few days of the issue of that report, and had been prepared without knowledge of the decisions on such matters enunciated in the report. At the hearing Pacific gave its views on how these decisions should apply to its application.

---

(1) OGCB Report 65-11. Report on the Applications for Permits authorizing the Removal of Propane from the Province of Canadian Hydrocarbons Limited and The British American Oil Company Limited under The Gas Resources Preservation Act, 1956. September, 1965.

Application

The application asked that Permit No. PP 62-1 be amended by extending its term, by increasing the annual volume of gas that may be processed to obtain the propane, by increasing the maximum volumes of propane that may be removed pursuant to the permit and by deleting reference to butanes. An outline of the applicant's submission and evidence appears in Section II of this report, and various parts of the application are discussed in detail in the appendices.

Hearing and Appearances

The application was heard by the Board on November 30, 1965. G. W. Lade appeared for Pacific. There were no interveners.

Qualification of Applicant

Pacific made its application as a person qualified to apply under section 5, subsection (1) of The Gas Resources Preservation Act, 1956.(2) It filed a statement signed by itself and Trans-

---

(2) Section 5, subsection (1) reads as follows:

> 5. (1) A person
> (a) who produces or has the right to produce gas or propane within the Province,
> (b) who purchases or otherwise acquires or has entered into a contract to purchase or otherwise acquire property in gas or propane within the Province, or
> (c) who transports, or has entered into a contract with the owner, producer, purchaser or acquirer of gas or propane undertaking to transport, gas or propane produced within the Province,
>
> and who proposes to remove gas or propane, or cause it to be removed, from the Province may make application to the Board for a permit authorizing the removal of gas or propane.

Canada Pipe Lines Limited, setting out the effect of certain provisions of their agreement of June 1, 1962. Under the agreement Trans-Canada granted Pacific the exclusive right to extract natural gas liquids from the gas purchased, produced or controlled by Trans-Canada and transported by Alberta Gas Trunk Line to the Empress plant up to a daily volume of 1.5 billion cubic feet. The agreement provided that title to the natural gas liquids passes to Pacific where the gas enters the Empress plant, and defines natural gas liquids to include propane. The term of the agreement will terminate after the operation of the project has become unprofitable and Pacific has notified Trans-Canada of its desire to terminate the agreement.

Further, Pacific has been operating its processing plant and removing the propane so obtained from the Province pursuant to Permit No. PP 62-1 since the spring of 1964.

In light of the above the Board accepted Pacific as a qualified applicant.

Date of Reserve Assessment and Period of Protection

Pacific in its submission estimated the propane reserves based on the most recent estimate of the Board of gas reserves (December 31, 1964). The Board has not completed a more recent study of gas reserves, and has also estimated the propane reserves as of December 31, 1964. The period over which it has assessed the requirements of the Province is 1966 to 1995 inclusive.

II SUBMISSION OF PACIFIC PETROLEUMS LTD.

Application

Pacific applied to the Board for a reconsideration of Permit No. PP 62-1 for the purpose of varying and amending the Permit by

(a) extending the term from May 14, 1981, to October 31, 1989,

(b) increasing the maximum quantity of gas that may be processed annually in the plant from 329 billion cubic feet to 547.5 billion cubic feet,

(c) increasing the maximum quantity of propane that may be removed from the Province from 3.5 million barrels to 5 million barrels annually, and from 56 million barrels to 101.3 million barrels during the term of the amended permit, and

(d) deleting from the Permit all reference to butanes.

At the hearing, Mr. Lade, referring to the maximum volume of 101.3 million barrels during the term of the permit, stated that the application preceded the Board's September report, and that, according to his understanding of the report, only annual restrictions would appear in the permit when it is amended.

Pacific intends to market the propane, the subject of the application, in Ontario and Quebec by jumbo tank car from the Winnipeg terminal of its Empress to Winnipeg pipe line.

Reserves of Propane

Pacific estimated the remaining recoverable reserves of propane in the Province to be some 490.6 million barrels at

December 31, 1964. The estimate was based upon the remaining marketable reserves of gas at December 31, 1964, as estimated by the Board and published in its report OGCB Report 65-8(1).

The reserves of propane estimated by Pacific were divided into four categories as follows:

1. Established Reserves - consist of reserves of propane from producing gas fields with existing gas plants either now extracting propane or for which propane extraction facilities are now proposed. Some 356.5 million barrels were considered as the reserves in this category.
2. Additional Reserves which may result from Moderate Increased Demand - consist of propane reserves from certain producing gas fields with existing plants which do not extract propane and for which propane extraction facilities have not yet been proposed. Pacific estimated that some 26.5 million barrels of propane can be expected from such fields.
3. Additional Reserves which may result from Maximum Increased Demand - consist predominantly of reserves in shut-in gas fields currently considered beyond economic reach. Pacific believed that under conditions of maximum demand the propane reserves in this category, estimated to be 47.6 million barrels, would be extracted by centrally located gas plants serving many outlying

---

(1) Reserves of Gas, Natural Gas Liquids, Crude Oil and Sulphur, Province of Alberta. December 31, 1964.

fields or areas.

4. Additional Reserves that may result from Two Years Growth of Gas Reserves - consist of reserves from two-years growth of gas reserves at the long term average annual rate of 2.5 trillion cubic feet. Reserves of some 60 million barrels were estimated in this category.

In summary, Pacific's estimate of the remaining reserves of propane at December 31, 1964, was:

	Millions of Barrels
Established Reserves	356.5
From Moderate Increased Demand	26.5
From Maximum Increased Demand	47.6
From Two Years Growth of Gas Reserves	60.0
Total	490.6

Details of Pacific's estimate of reserves may be found in Appendix A.

Year by Year Availability of Propane

Based on its estimate of the reserves of propane of 490.6 million barrels, Pacific estimated the availability of propane would increase from some 26,700 barrels per day in 1965 to some 42,700 barrels daily in 1977. Thereafter, the availability was forecast as declining gradually to about 19,800 barrels per day by the end of the thirty-year period in 1994.

Pacific estimated that during the thirty-year period some 75 per cent of the Provincial propane reserves of 490.6 million barrels will have been produced. With authorization of additional permits for the removal of gas, Pacific believed that additional propane supply would become available mainly from gas reserves beyond the two years growth of gas reserves so that the availability of propane could be maintained at some 42,000 barrels per day for an extended period beyond 1977.

Details of Pacific's availability forecast may be found in Appendix A.

Demand for Propane

The applicant presented a forecast of requirements for Alberta propane for a period extending to the end of 1994. At the hearing, summary tables were presented which extended the applicant's forecast in total to 1995, but did not provide a breakdown between the various categories of demand for this year.

1. Alberta Requirements

The applicant divided the market into three major categories: LPG distributors, petrochemical and miscible flood. At the hearing it was indicated that in preparing the forecast of LPG distributors demand considerable reliance had been placed upon a previous forecast by Canadian Hydrocarbons Limited and on consultations with Cigas Products Ltd. Consideration was also given to the British American forecast submitted to the Board earlier in 1965 and to the Board forecast published in its 1961 Foothills report.(2)

The LPG distributors market was treated as a whole, with no separate distinction accorded to domestic, commercial, industrial or carburetion consumption. Declining rates of growth were postulated, commencing with 7 per cent in 1966 and falling to a level of 2 per cent by 1980 and thereafter, to reflect increasing market saturation. Thus, LPG distributors demand was forecast to increase from 4,500 barrels per day in 1966 to 10,900 barrels per day in 1994.

---

(2) Report to the Lieutenant Governor in Council with Respect to the Application under The Gas Resources Preservation Act, 1956 of Foothills Pipe Lines Ltd. June, 1961.

In forecasting petrochemical demand, the applicant adopted the Chemcell (1963) Limited forecast, submitted as Exhibit 4 at the Canadian Hydrocarbons Limited hearing before the Board in April 1965, for the years prior to 1979, and the Board 1961 forecast thereafter. No specific provision was made for the establishment of new petrochemical plants utilizing propane as feedstock during the forecast period. Petrochemical consumption of propane was forecast to rise from 3,500 barrels per day in 1966 to 13,700 barrels per day in 1994.

Forecast miscible flood demand to 1968, set at 1,000 barrels per day, was based on the last two years actual consumption as reported by the Board. For the years after 1968, it was assumed that further miscible flood projects would be initiated and the forecast was increased to 2,000 barrels per day in 1969 and thereafter.

In total, Alberta demand for propane was forecast to rise from 9,000 barrels per day in 1966 to 27,300 barrels per day in 1995 resulting in overall thirty-year requirements of some 195 million barrels.

2. Other Requirements

A forecast of demand for propane in the fringe markets of southeastern British Columbia was included in the application. At the hearing the applicant deleted this projection as a result of the Board's policy with respect to fringe areas enunciated on page 31 of the September report.

Table IV of Exhibit 5 presented at the hearing included the applicant's existing permit commitments and those of Canadian Hydrocarbons and British American. For Canadian Hydrocarbons, the amounts shown assumed the filing with the Board of additional propane supply contracts. Total permit commitments were expected to increase from 10,900 barrels per day in 1966 to 13,640 barrels per day in 1968 and 1969, then to decline gradually to 9,780 barrels per day by 1980. From 1981 until the termination in 1986 of the last of the now issued permits, permit commitments amounted to 1,480 barrels per day. Total permit commitments were estimated to be 71 million barrels.

In summary, the applicant forecast that Alberta and permit requirements for propane would increase from 19,900 barrels per day in 1966 to 27,300 barrels per day in 1995, with total thirty-year requirements of some 266 million barrels.

Surplus

Pacific submitted that, based upon its studies, the present reserves and the year by year availability of propane in Alberta exceed the thirty-year requirements of Alberta, the present permit commitments, and the additional volumes requested by it.

Pacific submitted further that, with the granting of additional permits for removal of gas, additional propane reserves will be available from gas to be discovered and developed beyond the two years growth now being used by the Board. The result will be an increase in the propane surplus and will eliminate the possibility of any annual deficits in the latter part of the thirty-year forecast period.

The surplus at December 31, 1964, estimated by Pacific to be some 225 million barrels based upon its maximum estimated reserves, was determined in the following manner:

	Millions of Barrels	
Reserves of Propane		490.6
Alberta 30-year Requirements	195.0	
Present Permit Commitments	71.0	
Total Requirements		266.0
Present Surplus		224.6
Requested by Pacific	44.0	
Surplus if Request Approved		180.6

Furthermore, Pacific submitted that, based on its maximum estimated reserves, the three tests of a removable surplus enunciated in the September report have been satisfied.

First Test. Total reserves should exceed the estimated thirty-year requirements of the Province and the present permit commitments. A surplus of some 181 million barrels of propane, after satisfying the Provincial thirty-year requirements and the permit commitments, including Pacific's current request, was projected by Pacific. Pacific contended, therefore, that this test is satisfied.

Second Test. The year by year availability of propane should exceed the requirements of the Province and the permit commitments. Pacific estimated a daily surplus of 6,200 barrels in 1966 increasing to some 12,000 barrels in 1977, decreasing thereafter to an insignificant deficiency of 300 barrels per day in 1989. This surplus would exist after satisfying the needs of persons in Alberta, the present permit commitments and Pacific's request.

Third Test. The reserves remaining at the end of the proposed removal of propane should substantially exceed the total Provincial requirement for the remainder of the thirty-year period. Pacific estimated that the reserves of propane remaining at the expiry of its requested permit, 1989, would be some 170 million barrels, and that the requirements of Alberta for the remainder of the thirty-year period would be about 56 million barrels.

Summary

Pacific contended that since,

(a) the quantity of propane for which it requested an amendment to its permit is surplus to the present and future needs of persons in the Province and the present permit commitments, and

(b) the three tests of a removable surplus specified by the Board have been met, and

(c) the propane otherwise would leave the Province in the gas stream,

the application should be granted for the additional volumes requested.

Butanes

When Permit No. PP 62-1 was issued, The Gas Resources Preservation Act, 1956, applied to the removal from the Province, not only of pipe line gas, but also of liquid products of gas including propane and butanes and excepting only natural gasoline. As a result of amendments to the Act in 1963(3) the only liquid product to which the Act now applies is propane. Pacific's request for the deletion of reference to butanes in the permit reflects this amendment.

III FINDINGS

The Board having heard publicly the application under The Gas Resources Preservation Act, 1956, of Pacific Petroleums Ltd. and having studied the evidence submitted by the applicant at the public hearing, and having regard to the advice of its staff, to its own knowledge, and to its responsibility under the Act, finds as follows:

1. IN THE MATTER OF THE RECOVERABLE RESERVES AND THE YEAR BY YEAR AVAILABILITY OF PROPANE IN ALBERTA

The Board estimates the total recoverable reserves of propane in Alberta as of December 31, 1964, (being the date of reference of the Board's last comprehensive review of the reserves of propane and of gas) to be some 394 million barrels, of which some 330 million barrels will be recovered from existing processing plants and some 64 million barrels will be recovered by more complete processing of gas if there is sufficient demand for propane. The corresponding estimates made in September 1965 and presented in OGCB Report 65-11 are some 389, 325 and 64 million barrels respectively.

---

(3) Statutes of Alberta, 1963, chapter 22.

The Board estimates that production of propane from existing and Board approved plants will be approximately 29,000 barrels per day in 1966, and some 33,000 barrels per day from 1967 to 1979, and will decline to 14,000 barrels per day by 1989. The Board further estimates that if there is sufficient demand for propane, additional recovery will occur, at plants to be constructed in the future or by the installation of deep-cut recovery facilities at existing plants, in an amount of approximately 8,000 barrels per day commencing in 1968. Combining these two estimates gives a year by year availability of propane of some 29,000 barrels per day in 1966, 33,000 barrels per day in 1967, increasing to a level of approximately 41,000 barrels per day for the period, 1968 to 1979, and then gradually declining to about 19,000 barrels per day by 1989.

Details of the evidence and the Board's estimates of reserves and availability of propane are presented in Appendix A.

2. IN THE MATTER OF THE TRENDS IN EXPLORATION AND THE GROWTH OF RECOVERABLE RESERVES AND YEAR BY YEAR AVAILABILITY OF PROPANE IN ALBERTA

The Board has not altered its estimate of the growth of reserves of gas expected during a two-year period (4.3 trillion cubic feet), or of the reserves of propane associated with it (43 million barrels) presented in the September report.

While the Board has not changed its estimate of the year by year production expected from the two years growth of gas the period of consideration has been extended by three years to 1989, the end of the term of the permit requested. The Board estimates the year by year availability of propane from these reserves to commence in 1970 at a low rate and increase to about 5,000 barrels per day by 1989.

Details of the evidence and the Board's estimates are presented in Appendix A.

3. IN THE MATTER OF THE PRESENT AND FUTURE REQUIREMENTS OF ALBERTA FOR PROPANE AND THE PRESENT PERMIT COMMITMENTS

The Board estimates the requirements of Alberta for propane for the thirty-year period, January 1, 1966, to December 31, 1995, to be some 221 million barrels. The present estimate is unchanged from that presented in the September report.

With the issue of permits for the removal of propane to The British American Oil Company Limited and to Canadian Hydrocarbons Limited, the permit commitments at January 1, 1966, have increased from some 52 million barrels to some 71 million barrels.

Details of the evidence and the Board's estimates of Alberta's requirements and the present permit commitments are presented in Appendix B.

4. IN THE MATTER OF THE MEETING OF THE 1966-1995 REQUIREMENTS OF ALBERTA, TOGETHER WITH THE PRESENT PERMIT COMMITMENTS AND THE RESULTING SURPLUS

Having regard to the 330 to 394 million barrels of propane estimated to be recoverable from established gas reserves, the 43 million barrels of propane estimated to be recoverable from two years growth of gas reserves, the thirty-year requirements of Alberta of 221 million barrels of propane, and the present permit commitments of 71 million barrels, the Board finds that there is an overall surplus of 81 to 145 million barrels of propane. The 81 million barrels is based on existing facilities and the 145 million barrels on future facilities.

The Board estimates that after providing for the annual requirements of Alberta and the subsisting permit commitments there will be a propane surplus, based on production from existing facilities, of some 9,000 barrels per day in 1966 which will increase to approximately 10,000 barrels per day in the years 1967 to 1969 and decline gradually thereafter to some 1,200 barrels per day by 1983. A deficit of some 1,600 barrels per day is indicated in 1984, increasing to approximately 6,900 barrels per day in 1989. If allowance is made for future processing facilities, the surplus in 1966 and 1967 is unchanged, but then increases to some 17,000 barrels per day in 1968, and declines thereafter to a balanced position in 1988 and becomes a deficit of some 1,600 barrels per day by 1989. As indicated in the

September report, the Board places greater weight on the latter figures and is satisfied that the deficiencies indicated by restricting the analysis to existing facilities will not materialize.

The Board estimates that the reserves of propane in 1989, at the end of the term of the requested permit, will be 115 million barrels with existing facilities and 119 million barrels including future facilities. Alberta's requirements for the remainder of the thirty-year period, 1990 to 1995, are some 60 million barrels, thus indicating a surplus, above the requirements of the remainder of the forecast period, of 55 to 59 million barrels.

Details of the evidence and the Board's analysis of these matters appear in Appendic C.

5. IN THE MATTER OF PACIFIC PETROLEUMS LTD.'S REQUEST FOR AUTHORIZATION FOR THE REMOVAL OF PROPANE AND THE SURPLUS WHICH WOULD RESULT IF A PERMIT IS GRANTED

The Board finds that the volumes of propane from the Empress plant that it could consider for removal from the Province are significantly less than those requested by Pacific Petroleums Ltd. Firstly, the Board's estimate of the production of propane at the Empress plant is significantly less than that of Pacific and less than the volumes Pacific has requested permission to remove. Secondly, a portion of the volumes of propane expected by the Board to be available at the plant during the latter years (1984-1987) of the requested term is not now indicated to be surplus to the annual requirements of Alberta and the present permit commitments. As the Board now assesses the situation, after 1987 none of the propane at the Empress plant will be surplus to the annual requirements of Alberta and the present permit commitments.

The Board finds that, if Pacific Petroleums Ltd. is authorized to remove the lesser volumes of propane set out in Table D-4, the reserves of propane surplus to the thirty year requirements of Alberta and the subsisting permit commitments would be reduced to 58 million barrels based on existing facilities and 122 million barrels including future facilities.

The Board finds that after providing for the annual Alberta requirements, the present permit commitments, and the application to the extent that the Board is prepared to consider it, the year by year surplus of propane from existing facilities and from two years growth of gas reserves would be some 8,000 barrels per day for the period 1966 to 1969 inclusive and thereafter would decline to a balanced position in 1979 and would become a deficit of some 1,500 barrels per day in 1980, increasing further to a deficit of some 7,000 barrels per day in 1987. If allowance is made for future processing facilities, the surplus in 1966 and 1967 is unchanged, but then would increase to some 15,000 barrels per day in 1968 and 1969, declining thereafter to a balanced position during the period, 1984 to 1987. As in the previous finding, the Board places greater weight on these latter figures.

Should the application be granted in the reduced volumes indicated above, the reserves remaining in 1987 at the end of the term of the permit, the remainder of the thirty-year requirements and permit commitments and the resulting surplus would be 129, 79 and 50 million barrels respectively based on existing facilities; and 137, 79 and 58 million barrels respectively including future facilities.

The Board concludes that Alberta's requirements and the subsisting permit commitments would be protected fully if Pacific Petroleums Ltd. were permitted to remove from the Empress plant during the period, 1966 to 1987, the reduced volumes of propane set out in Table D-4.

Details of the evidence and the Board's analysis relating to these matters are presented in Appendices A and D.

6. IN THE MATTER OF THE DISPOSITION OF THE APPLICATION OF PACIFIC PETROLEUMS LTD.

All things considered, the Board is prepared, with the approval of the Lieutenant Governor in Council, to refuse the application for the full volumes of propane applied for by Pacific Petroleums Ltd., but is prepared, with the approval of the Lieutenant Governor in Council, to grant Pacific's request in part by rescinding the existing Permit No. PP 62-1, and by issuing a new permit to Pacific Petroleums Ltd. authorizing it to remove from the Province a lesser volume of propane and for a shorter period than applied for, the permit to be in the form shown in Appendix E, and for the volumes and subject to the terms and conditions therein contained.

Furthermore, since The Gas Resources Preservation Act, 1956, has been amended to delete all reference to butanes, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant Pacific Petroleums Ltd.'s request for deletion of all reference to butanes in the new permit.

Respectfully submitted,

G. W. Govier, P. Eng.,
Chairman.

A. F. Manyluk, P. Eng.,
Deputy Chairman.

Vernon Millard,
Board Member.

Dated at Calgary, Alberta,
this 18th day of January, 1966.

APPENDIX A

THE PRESENT AND FUTURE PRODUCTION AND THE RESERVES OF PROPANE IN THE PROVINCE OF ALBERTA

Future Production of Propane

1. Production of Propane from Established Gas Reserves

(1) Views of Pacific

During the hearing of the Pacific application, evidence as to the expected propane production from established gas reserves for the period, 1965 to 1994 inclusive, was given on behalf of the applicant by G. D. Nickoloff. In preparing its forecast, Pacific used the Board's estimate of gas reserves as of December 31, 1964.

In the Pacific submission, propane production from established gas reserves is expected to increase from a 1965 production rate of some 27,000 barrels per day to about 38,000 barrels per day by 1969 and to remain at that level until about 1977. The production is then expected to decline steadily to a level of about 15,000 barrels per day by 1994.

The forecast submitted by Pacific was prepared generally in the following manner:

1. The propane supply from oil and gas fields with existing or proposed propane recovery facilities was estimated on an individual plant basis. The individual estimates reflect gas production rates for each field or area as forecast by Pacific. In areas where the plant feed will be oilfield separator gas the producing rate was forecast on the basis of oil allowables expected by Pacific and the method of depletion. Plant recovery factors were based on plant performance or on design

where Pacific indicated that propane extraction was proposed by the producers. The forecast of propane production for plants reprocessing pipe line gas was based on the estimated composition of the residue gas available from the fields or areas supplying such plants, the expected gas throughput in such plants and the propane recovery efficiencies currently being experienced.

2. Additional propane production that may result from moderate increased demand was predicted for six gas plants which currently do not extract propane. These estimates were based on projected gas throughputs, current gas plant stream analyses and an assumed propane recovery efficiency of fifty per cent.
3. Additional propane production that may result from maximum increased demand was also predicted. This category included all other gas reserves in the Province which have a heating value in excess of 1,000 Btu's per cubic foot. Most of these reserves are currently beyond economic reach, and Pacific estimated that propane production from this source will begin in 1975 at some 100 barrels per day and increase to some 2,000 barrels per day by 1994.

(2) Views of the Board

The Board has reviewed its own forecast of propane production from established gas reserves presented in Tables A-1 and A-2 of the September report having regard to recent approvals by the Board of additional processing facilities and to evidence submitted by

Pacific at the hearing. With respect to Table A-1 "Forecast of Propane Production from Established Gas Reserves Based on Existing Plant Facilities" of its earlier report, the Board has revised upwards the projected propane production from four plants. The future propane production from The British American Oil Company Limited's Nevis plant has been increased by about 600 barrels per day in the light of the recent approval by the Board of an application for an increase in capacity and the installation of deep-cut recovery facilities at the plant. The forecast production from the Turner Valley plant has been increased by some 150 barrels per day for a similar reason. The expected pattern of propane production from the Pincher Creek plant has been altered to reflect a more recent estimate by the Board of the manner in which the Pincher Creek Field will be depleted.

The forecast propane production from the Empress plant has been increased as a result of both an increase in the estimated liquid content of the inlet gas and an increase in the amount of gas expected to be available for processing. The predicted increase in the liquid content of the inlet gas results from an increase in the estimated propane content of the residue gas from several fields. However, this has been partially offset by a decline in the content of the residue gas expected from the Nevis plant because of the planned increase in propane recovery. The increase in the gas available for processing results because the Board in the September report did not consider the shrinkage or Btu loss which occurs at the Empress plant and its impact on the volumes of gas which will enter the plant.

The forecast presented in Table A-1 of the September report covered the period 1966 to 1986 inclusive. Since Pacific has applied for an extension of its permit to 1989, and in order to use the three tests enunciated by the Board, the Board's forecast was extended for three years. This was done on an individual plant basis following the general procedure outlined by the Board in pages A-8 to A-11 of the September report.

The Board's revised forecast of propane production from established reserves and existing facilities is presented in Table A-1. Also shown in the table are the comparable forecasts taken from Table A-1 of the September report and the forecast prepared by Pacific. (In Table A-1 and all subsequent tables in this appendix all production figures have been rounded to the nearest 100 barrels).

The table shows that the revised Board forecast is some 1,500 barrels per day greater than the earlier forecast for the period 1966 to 1976. The difference declines to some 200 barrels per day by 1986. The revised forecast predicts an increase from a 1965 propane production rate of some 25,000 barrels per day to a peak of about 34,000 barrels per day in 1968. The production is then expected to remain approximately level until 1976 and to decline slowly to about 14,000 barrels per day by 1989, the end of the forecast period.

Table A-1 also shows that the production from established gas reserves and existing facilities as forecast by Pacific is lower than the Board forecast for the first two years, but is greater by some 2,000 barrels per day for the period 1968 to 1983 inclusive. Thereafter the difference increases and by 1989 the Pacific estimate is over 5,000 barrels per day greater than the Board's estimate. Although there are many minor differences in the forecast production when referring to individual plants, it appears that the difference in the estimated totals is due almost entirely to the higher estimate by Pacific of propane production at the Empress plant. In this regard, the Board has reviewed the detailed data presented by Pacific in support of its estimated propane production from the Empress plant and is of the opinion that the inlet gas propane content has been estimated too high by Pacific with respect to gas from the Homeglen-Rimbey and Westerose South fields.(1) Also, because of previously mentioned modifications planned for the Nevis plant, the propane content used in the Pacific submission for the Erskine, Hackett and Nevis fields is, in the opinion of the Board, too high.(2) In addition, the Pacific estimate of production from the Empress plant applied an average propane recovery factor based on reserves as set by the Board to the total Empress plant throughput as projected by Trans-Canada Pipe Lines Limited. A detailed study (incorporating the most recent Trans-Canada deliverability study available to the Board) indicated that the throughput from individual fields will in all likelihood be such that the actual liquid content will be lower than the average based on Board set reserves.(3) For these reasons, the Board does not accept the forecast of propane production from the Empress plant prepared by Pacific, but has altered its own earlier forecast slightly in accordance with certain data presented at the recent hearing and the approval of modifications at the Nevis plant. The projected production as now estimated by the Board from the Empress plant is presented in Table A-2. Also included are the comparable estimates presented by the Board in the September report and by Pacific in its submission. The table shows that even though the Board has revised upwards its estimate of production from the Empress plant, it remains considerably lower than the Pacific forecast.

---

(1) Results in a reduction of about 500 barrels per day.
(2) Results in a reduction of about 700 barrels per day.
(3) Results in a reduction of about 1,000 barrels per day.

The Board has also reviewed Table A-2 "Forecast of Additional Propane Production from Established Gas Reserves and Future Plant Facilities" of the September report. The Board is of the opinion that no change is warranted in this part of the forecast at this time. It recognizes that a portion of the increased production contemplated in its earlier report from the Nevis plant has already materialized. However, because the earlier forecast of increased production included only a judgment portion of the total possible increase, the Board remains convinced that the increase predicted can still result at other existing plants through the installation of deep-cut recovery facilities.

The Board has also reviewed, in the light of the Pacific forecast of additional propane production that might result from moderate and maximum increased demand, the make-up of its earlier list of plants where propane recovery may result from facilities to be installed in the future. In total, this category as predicted by the Board is greater than the comparable production forecast by Pacific, but the Board is confident that it is reasonable. As in the case of the forecast from existing facilities, the forecast from future facilities has been extended to 1989.

The Board's current forecast of additional propane production from established gas reserves and future plant facilities is shown in Table A-3. Since no change has been made, the estimates have been taken directly from the September report. Also shown are the comparable estimates made by Pacific. The table shows that the Board's forecast of propane production from this source is some 5,000 barrels per day greater than the Pacific forecast until about 1980. Thereafter the difference declines to about 2,000 barrels per day by 1989. The difference in the early years arises mainly because the Board has included in its estimate, provision for a plant to reprocess gas on the Foothills Division of Alberta Gas Trunk Line beginning in 1968, while Pacific included only a small amount of production which may result from maximum increased demand for propane. The Pacific estimate of propane production from this source increases throughout the period of the forecast, thus reducing the difference.

Table A-4 has been prepared to compare the Board's forecast of total propane production from established gas reserves to the Pacific forecast. The forecasts represent a combination of those amounts shown in Tables A-1 and A-3.

The table shows that for approximately the next twenty years the Board's forecast from established reserves is considerably higher than the forecast presented by Pacific. This is because the Pacific estimates are much lower with respect to expected additional production from future processing facilities. For the later years the Pacific forecast is higher than the Board's. This is primarily because the Board forecast reflects a more rapid decline in gas deliverability from fields supplying the Empress plant than the Pacific forecast.

2. Production of Propane from Gas Reserves Not Yet Discovered

(1) Views of Pacific

Pacific included in its submission a propane production forecast from two years growth of gas reserves. It predicted propane production from this source beginning in 1969 at some 1,200 barrels per day, increasing rapidly to some 4,800 barrels per day by 1975 and thereafter increasing slowly to 5,200 barrels per day by 1994. These estimates were made generally in the following manner:

1. The two years growth of gas reserves was estimated at five trillion cubic feet based on the long term growth rate estimated by the Board in OGCB Report 65-8(4).
2. The recoverable propane content was estimated to be 12 barrels per million cubic feet of gas. This factor was based on the total remaining marketable propane reserves estimated by Pacific and the total remaining marketable gas reserves estimated by the Board as of December 31, 1964.
3. It was estimated that two trillion cubic feet of the growth in gas reserves will be extensions to existing reservoirs and that this portion of the growth will result in the

---

(4) Reserves of Gas, Natural Gas Liquids, Crude Oil and Sulphur, Province of Alberta. December 31, 1964.

production of 1,200 barrels per day of propane beginning in 1969 increasing to 2,400 barrels per day in 1970 and remaining constant thereafter.

4. It was estimated that two trillion cubic feet of the growth in gas reserves will be new discoveries which will yield 480 barrels of propane per day beginning in 1971 and increasing by 480 barrels per day each year until 1975. Production from this portion of the future gas reserves will remain constant thereafter.
5. It was estimated that one trillion cubic feet of the growth in gas reserves will be new discoveries in pools which are initially beyond economic reach. It was estimated that this gas would result in propane production of thirty barrels per day beginning in 1975 and increasing by thirty barrels per day each year for the remainder of the period of the forecast.

(2) Views of the Board

The Board has reviewed its estimate, presented in the September report, of the propane recoverable from two years growth of gas reserves in the light of the forecast submitted by Pacific. The Board's estimate of production from this source is considerably lower than Pacific's, for the following reasons:

1. The Board in its earlier study referred to a detailed analysis of the trends in the growth and discovery of gas reserves as of December 31, 1964. The study showed that the long term growth rate for gas reserves was some

2.5 trillion cubic feet per year. However, it also showed that the actual reserve growth over the two-year period prior to the report was only some 4.3 trillion cubic feet. In keeping with the policy of using the lesser of the actual growth in reserves over the two previous years or two years growth at the long term rate, it was decided to rely on the propane expected from only 4.3 trillion cubic feet of gas reserves not yet developed. The Pacific study used the growth expected over two years at the long term rate or a total of five trillion cubic feet.

2. The Board estimated that the future gas reserves would on the average contain about 20 barrels of propane per million cubic feet of gas and that 50 per cent of the propane in this gas would be recovered. The Pacific estimated recovery factor of 12 barrels per million cubic feet was based on the ratio of the total remaining propane reserves estimated by Pacific to the remaining gas reserves estimated by the Board. The propane reserves included 43.3 million barrels that may result from maximum increased demand. Since most of these reserves are in small gas pools now considered beyond economic reach, the Board does not believe that such reserves should be included in the Provincial total. Eliminating this portion of the reserves from the Pacific analysis results in a recoverable propane ratio of approximately 10.8 barrels per million cubic feet.

3. In the September report the Board projected the annual pattern by which new gas reserves will be produced by estimating the amount of the future reserves that will be required to help meet Alberta's thirty-year requirements for gas. The study indicated that as of June 30, 1965, all of the expected growth of 4.3 trillion cubic feet will be needed to satisfy the Province's requirements. The Board estimated that propane production from this source will begin at low rates about 1970 and build up slowly throughout the forecast period. Pacific assumed that the two year growth in gas reserves will be surplus to Alberta's requirements and be available to supply future extra-provincial markets. This results in production from future gas, along with associated propane production, earlier and at higher rates than forecast by the Board. The Board believes the Pacific assumption to be valid only if weight is given to more than the two years growth of gas reserves that the Board considers when providing for the future requirements of the Province.

On the basis of its review, the Board believes its earlier analysis was a proper one and has decided not to alter it. Since Pacific is requesting an amendment to its permit extending it to 1989, the Board has extended its earlier analysis by three years. Propane production from the expected growth in gas reserves has been estimated at 4,020, 4,450 and 5,000 barrels per day for the years, 1987, 1988 and 1989, respectively.

Table A-5 presents a comparison of the total future propane production estimated by the Board with that estimated by Pacific. The Board estimates have been taken from Tables A-1 and A-3 of this report and Table A-4 of the September report. The Board forecast from existing plant facilities and two years growth of gas reserves is lower than the Pacific forecast. The difference is largely the result of the higher production forecast by Pacific for the Empress plant and from gas reserves not yet developed. The Board forecast including future plant facilities and two years growth of gas reserves agrees closely with the Pacific forecast until about 1982. Thereafter it is lower primarily because of the higher estimate by Pacific of the propane to be produced from two years growth of gas reserves.

Reserves of Propane

(1) Views of Pacific

Pacific in its submission estimated the total available reserves of propane in the Province from established gas reserves to be some 431 million barrels. This propane reserve was estimated as follows:

1. Propane reserves from fields on stream with existing or proposed propane recovery facilities were estimated at some 357 million barrels. This reserve represents a summation of individual plant estimates which were based on propane yields experienced to date or on design data for proposed facilities.

2. Additional propane reserves that may result from moderate increased demand were estimated at about 27 million barrels. This reserve represents the propane that could be recovered at six existing plants in the Province if propane recovery facilities were installed. The estimate reflects the gas analyses of the inlet streams at the individual plants and a propane recovery factor of 50 per cent.
3. Additional propane reserves that may result from maximum increased demand were estimated at some 48 million barrels. This reserve represents the recovery of 50 per cent of the propane from all other gas reserves in the Province with a heating value of greater than 1,000 Btu's per cubic foot. These reserves are predominently in shut-in gas fields now beyond economic reach.

In addition, Pacific estimated that some 60 million barrels of propane would be available from two years growth of gas reserves. This estimate was made by accepting the Board's long-term growth rate for gas of 2.5 trillion cubic feet per year and applying a propane recovery ratio of 12 barrels per million cubic feet.

Combining the above figures, results in total propane reserves as estimated by Pacific of some 491 million barrels.

(2) Views of the Board

The Board has reviewed its estimate of the established propane reserves as of December 31, 1964, and the propane associated with two years growth of gas reserves as was presented in the September report. With respect to part A of Table A-6 of the September report, the Board has increased the recoverable reserves from the Nevis and Turner Valley plants by about five million barrels because of the increased recovery expected from the processing plants. Although the Board has also altered the production forecast for the Pincher Creek and Empress plants the changes have arisen primarily from changes in the patterns of production rather than in the total propane to be produced, and as a result no change has been made to the reserves. The increased reserves for the Nevis and Turner Valley plants will increase the reserves recoverable from existing facilities by this five million barrels to some 330 million barrels. With respect to reserves from future plant facilities (parts B and C of Table A-6 in the September report), the Board believes no change is necessary at this time. The Board has estimated propane reserves from future facilities at some 64 million barrels.

It has been mentioned earlier in this appendix that the Board has reviewed its estimate of the propane recoverable from two years growth of gas reserves. The Board believes its earlier estimate of some 43 million barrels resulting from 4.3 trillion cubic feet of gas with a propane content of some 20 barrels per million cubic feet and a recovery factor of 50 per cent is proper.

Combining the above figures results in the Board estimate of total recoverable propane reserves as of December 31, 1964, of some 437 million barrels.

Table A-6 has been prepared to compare the Board's estimate of propane reserves to the Pacific estimate. The table includes the comparable estimates from established gas reserves and existing plant facilities, from established gas reserves and future plant facilities, from two years growth of gas reserves and the total propane reserves.

The table shows that the Board's estimate of propane from established gas reserves and existing facilities is lower by some 27 million barrels than the Pacific estimate. This results primarily because of higher reserves estimated by Pacific for the Judy Creek and Empress plants.

The Board's estimate from future plant facilities is slightly lower than the Pacific estimate. The latter estimate includes some 48 million barrels of propane that may result from maximum increased demand. Because most of these reserves are in small pools and are now beyond economic reach, the Board does not believe that they should be considered when protecting for the future requirements of the Province. If this portion of the reserves is eliminated from Pacific's estimate, then the Board's estimate of reserves from future facilities is much higher than the Pacific estimate. This is because the Board has considered the likelihood of propane facilities being installed at several more plants than did Pacific and also because the Board provided for a possible future plant to reprocess gas on the Foothills Division of Alberta Gas Trunk Line.

The table also shows that the Board's estimate of propane reserves associated with two years growth of gas reserves is lower than the estimate made by Pacific. This is primarily because Pacific used both a higher propane recovery ratio and a higher growth rate for gas than that used by the Board.

TABLE A-1

FORECAST OF PROPANE PRODUCTION FROM ESTABLISHED GAS RESERVES BASED ON EXISTING PLANT FACILITIES (BARRELS PER DAY)

Year	Board Estimate September, 1965	Pacific Estimate	Current Board Estimate
1966	28,200	27,000	29,200
1967	31,400	30,700	32,900
1968	32,400	34,700	33,800
1969	32,200	35,400	33,600
1970	31,900	35,900	33,300
1971	31,600	35,800	33,100
1972	32,200	35,500	33,600
1973	32,000	35,200	33,400
1974	31,900	35,000	33,300
1975	31,800	34,700	33,200
1976	31,600	34,400	32,900
1977	31,300	35,000	32,600
1978	31,100	34,300	32,300
1979	30,800	33,300	32,000
1980	30,000	30,600	30,400
1981	27,900	29,000	28,300
1982	25,000	27,300	25,400
1983	22,900	26,000	23,300
1984	20,400	24,900	20,800
1985	19,100	23,400	19,400
1986	17,600	22,700	17,800
1987		22,000	15,900
1988		21,200	14,900
1989		20,600	13,900

TABLE A-2

FORECAST OF PROPANE PRODUCTION FROM THE EMPRESS PLANT (BARRELS PER DAY)

Year	Board Estimate September, 1965	Pacific Estimate	Current Board Estimate
1966	8,900	9,800	9,800
1967	9,500	9,900	10,300
1968	10,200	12,100	11,000
1969	10,200	12,700	11,000
1970	10,200	13,200	11,000
1971	10,200	13,200	11,000
1972	10,200	13,200	11,000
1973	10,200	13,200	11,000
1974	10,200	13,200	11,000
1975	10,200	13,200	11,000
1976	10,200	13,200	11,000
1977	10,200	13,200	11,000
1978	10,200	12,800	11,000
1979	10,200	12,100	11,000
1980	10,200	11,400	10,200
1981	9,600	10,800	9,600
1982	8,900	10,200	8,900
1983	8,200	9,600	8,200
1984	7,500	9,000	7,500
1985	6,800	8,500	6,800
1986	6,000	8,000	6,000
1987		7,600	5,200
1988		7,100	4,400
1989		6,700	3,600

TABLE A-3

FORECAST OF ADDITIONAL PROPANE PRODUCTION FROM ESTABLISHED GAS RESERVES AND FUTURE PROCESSING FACILITIES (BARRELS PER DAY)

Year	Board Estimate September, 1965	Pacific Estimate	Current Board Estimate
1966	0	0	0
1967	0	0	0
1968	6,600	500	6,600
1969	6,800	2,800	6,800
1970	7,200	2,700	7,200
1971	7,500	2,700	7,500
1972	7,600	2,600	7,600
1973	7,700	2,600	7,700
1974	7,700	2,600	7,700
1975	8,100	2,600	8,100
1976	8,100	2,800	8,100
1977	8,000	2,900	8,000
1978	8,000	3,000	8,000
1979	8,000	3,100	8,000
1980	8,000	3,200	8,000
1981	8,000	3,300	8,000
1982	8,000	3,400	8,000
1983	8,000	3,500	8,000
1984	7,900	3,600	7,900
1985	7,800	3,500	7,800
1986	7,400	3,400	7,400
1987		3,300	6,700
1988		3,200	5,900
1989		3,200	5,200

TABLE A-4

FORECAST OF PROPANE PRODUCTION FROM ESTABLISHED GAS RESERVES INCLUDING FUTURE PROCESSING FACILITIES

(BARRELS PER DAY)

Year	Board Estimate September, 1965	Pacific Estimate	Current Board Estimate
1966	28,200	27,000	29,200
1967	31,400	30,700	32,900
1968	39,000	35,200	40,400
1969	39,000	38,200	40,400
1970	39,100	38,600	40,500
1971	39,200	38,400	40,600
1972	39,800	38,100	41,200
1973	39,700	37,800	41,100
1974	39,600	37,500	41,000
1975	39,900	37,300	41,300
1976	39,600	37,200	41,000
1977	39,300	37,800	40,600
1978	39,100	37,300	40,300
1979	38,800	36,400	40,000
1980	38,000	33,800	38,400
1981	36,000	32,300	36,300
1982	32,900	30,700	33,400
1983	30,900	29,500	31,200
1984	28,400	28,400	28,700
1985	26,900	26,900	27,200
1986	25,000	26,000	25,200
1987		25,200	22,600
1988		24,400	20,900
1989		23,700	19,200

TABLE A-5

FORECAST OF PROPANE PRODUCTION FROM ESTABLISHED GAS RESERVES AND GAS RESERVES NOT YET DEVELOPED (BARRELS PER DAY)

Year	Pacific Estimate	BOARD ESTIMATE: From Existing Processing Facilities and Two Years Growth of Gas Reserves	BOARD ESTIMATE: Including Future Processing Facilities and Two Years Growth of Gas Reserves
1966	27,000	29,200	29,200
1967	30,700	32,900	32,900
1968	35,200	33,800	40,400
1969	39,400	33,600	40,400
1970	41,000	33,300	40,600
1971	41,300	33,200	40,700
1972	41,500	33,800	41,400
1973	41,600	33,700	41,400
1974	41,800	33,700	41,400
1975	42,200	33,700	41,800
1976	42,000	33,600	41,700
1977	42,700	33,400	41,400
1978	42,200	33,400	41,400
1979	41,300	33,400	41,400
1980	38,800	32,000	40,000
1981	37,300	30,200	38,200
1982	35,700	27,600	35,600
1983	34,500	25,800	33,700
1984	33,500	23,500	31,400
1985	32,000	22,400	30,200
1986	31,200	21,400	28,800
1987	30,400	19,900	26,600
1988	29,600	19,400	25,300
1989	29,000	18,900	24,200

TABLE A-6

RECOVERABLE PROPANE RESERVES AS OF DECEMBER 31, 1964

(MILLIONS OF BARRELS)

PROPANE RESERVES	PACIFIC ESTIMATE		BOARD ESTIMATE	
	From Existing Processing Facilities	Including Future Processing Facilities	From Existing Processing Facilities	Including Future Processing Facilities
FROM ESTABLISHED GAS RESERVES	357	431	330	394
FROM TWO YEARS GROWTH OF GAS RESERVES	60	60	43	43
TOTAL RECOVERABLE PROPANE RESERVES	417	491	373	437

APPENDIX B

ALBERTA PROPANE REQUIREMENTS AND PERMIT COMMITMENTS

Appendix B summarizes the Pacific forecast of Alberta requirements and existing permit commitments, compares this projection with the Board forecast published in the September report, and presents the Board's views on the differences between the two forecasts.

At the hearing Pacific supplied a schedule showing total Alberta requirements for 1995, with no breakdown of these requirements between the categories of demand adopted by Pacific. Subsequently, the Board obtained from Pacific the breakdown of the forecast 1995 requirements, which has been included in the tables.

All references to the Board forecast relate to that published in the September report.

Alberta Propane Requirements

The applicant listed three categories of demand: LPG distributors, petrochemical and miscible flood.

1. LPG distributors

(1) Views of Pacific

Pacific did not distinguish between domestic, commercial, carburetion and industrial consumption composing this demand category, but rather treated it in aggregate. The projection of LPG distributors demand was predicated primarily on a study of the Canadian Hydrocarbons Limited and The British American Oil Company Limited forecasts submitted to the Board earlier in 1965, and the

Board forecast published in the Foothills report.(1) In addition, the applicant consulted Cigas Products Ltd., one of the main distributors of propane in the Province, and emphasized the fact that Canadian Hydrocarbons and Cigas Products combined serviced some 65 to 70 per cent of the current Alberta market.

Growth rates were postulated for the LPG distributors market, based on judgment. These exhibited a secular decline over the forecast period from a level of 7 per cent over the years 1966 to 1969 to 2 per cent from 1980 onwards. This predicted pattern was intended to reflect the increasing degree of market saturation and hence lessening scope for growth. When questioned concerning the carburetion demand for propane, Mr. J. D. Kirkpatrick, a witness for the applicant, replied that he anticipated substantial growth in the tractor market.

Pacific forecast LPG distributors demand to increase from some 4,500 barrels per day in 1966 to some 11,100 barrels per day by 1995. Thirty-year requirements were anticipated to total some 89 million barrels.

(2) Views of the Board

Since Pacific did not show a breakdown between domestic, commercial, industrial and carburetion demand in projecting LPG distributors requirements, to permit comparison the Board has combined its forecast of consumption for these categories to represent LPG distributors consumption.

The Board in examining the Pacific forecast finds itself in agreement with the postulated declining trend in the rate of growth in consumption shown for the later forecast years, as market penetration increases and the scope for further extensions becomes more limited. However, it believes that the declining rate of increase which Pacific postulates as commencing in 1966 may result in an underestimate of the rapidity with which the potential propane market may be exploited in the immediate future. Also, the Board considers that initially the Pacific forecast is low, since its forecast consumption for 1966 of some 4,500 barrels per day is lower than the Board estimate of consumption in 1965, based upon eleven months actual data, of some 4,900 barrels per day.

---

(1) Report to the Lieutenant Governor in Council with Respect to the Application under The Gas Resources Preservation Act, 1956 of Foothills Pipe Lines Ltd. June, 1961.

Table B-1 shows a comparison between Pacific's projection and the Board's forecast. The Board prediction is initially some 500 barrels per day higher than Pacific's and the absolute annual difference increases to some 1,700 barrels per day by 1995. Although overall cumulative growth rates over the entire thirty-year period are similar, a different pattern of growth is exhibited within the period. Over the first half of the period, the Board forecast rises more rapidly than Pacific's, while for the second half the converse applies. The higher initial projected demand and different growth rate pattern is reflected in the variation between the estimates of thirty-year requirements of some 18 million barrels.

2. Miscible Flood Demand

(1) Views of Pacific

A stable demand of 1,000 barrels per day was postulated for the period 1966 to 1968, to pattern the demand in recent years.

After 1968, it was assumed that projects similar to the Golden Spike scheme might be initiated in the Leduc reefs. Other miscible flood projects in some future fields were also considered a possibility. Consumption of 2,000 barrels per day was thus expected for the period 1968 to 1995. Pacific indicated that this number did not relate to specific projects, but was rather an estimate of overall requirements. Thirty-year requirements totalled some 21 million barrels.

(2) Views of the Board

Table B-2 shows a comparison between Pacific's forecast and the Board's. The Board does not believe the figures are directly comparable, since the Board figures relate solely to non self-sustaining schemes, whereas those of Pacific include provision for schemes similar to that in Golden Spike. Such a project has been designated as self-sustaining in the Board forecast since the propane involved was not included in supply.

3. Petrochemical Demand

(1) Views of Pacific

The applicant adopted the forecast by Chemcell (1963) Limited of its requirements for the period up to and including 1978. This forecast was submitted by Chemcell as Exhibit 4 at the April 1965 hearing(2). For the years from 1979 to 1995 Pacific adopted the Board 1961 forecast. At the hearing Mr. Kirkpatrick indicated that provision for new petrochemical plants utilizing propane was not included by him but may be appropriate 10 to 15 years in the future.

---

(2) Hearing before the Oil and Gas Conservation Board with respect to the application by Canadian Hydrocarbons Limited for a permit authorizing the removal of propane from the Province of Alberta.

Pacific expected that petrochemical consumption would grow from 3,500 barrels per day in 1966 to 14,200 barrels per day by 1995. Total thirty-year requirements amounted to some 85 million barrels.

(2) Views of the Board

The Board consulted Chemcell (1963) Limited, concerning future requirements, and the company indicated that it was not appropriate to revise the forecast it submitted at the Canadian Hydrocarbons hearing. While Pacific made no specific provision for new petrochemical plants, the Board continues to believe that such a provision should be included.

Table B-3 compares the Pacific and current Board forecasts of petrochemical demand. Similar to LPG distributors requirements, the overall cumulative growth rates are virtually the same, but the different pattern of growth within the period results in a divergence of thirty-year requirements.

4. Total Alberta Requirements

A comparison of the forecasts of total Alberta requirements of propane by Pacific and the Board is presented in Table B-4.

For the thirty-year period as a whole the overall rates of growth for the two forecasts are virtually the same. However, the patterns of growth within the period show significant differences. The Board forecast exhibits a markedly more rapid average rate of growth from 1966 to 1981 of 6.2 per cent, as compared to 4.6

per cent for Pacific. The absolute difference in consumption estimates for 1981 amounts to some 4,600 barrels per day. For the remainder of the forecast period the converse situation obtains, with the Pacific average growth rate for 1981 to 1995 being 3.2 per cent, while the Board's is 1.8 per cent. This average higher rate of growth estimated by Pacific for the latter half of the period reduces the gap in expected annual consumption to some 1,100 barrels per day by 1995. The effect of these different growth patterns is reflected in the amount by which the Board's total requirements exceed those of Pacific, some 26 million barrels.

5. Permit Commitments and Other Requirements

Three permits to remove propane from the Province have been issued. The existing Pacific Permit No. PP 62-1 runs to May 14, 1981, with amounts of no more than 9,600 barrels per day in any consecutive twelve-month period nor more than 56 million barrels during the term of the permit. Canadian Hydrocarbons' Permit No. CH 65-1 has a term from November 1, 1966, to October 31, 1986, with maximum amounts for consecutive twelve-month periods declining from some 2,100 barrels per day in 1967 to some 1,500 barrels per day for 1974 and subsequent periods. The term of the British American Permit No. BA 65-1 commenced on November 1, 1965, and ends on October 31, 1975, with amounts not exceeding 2,000 barrels per day in any consecutive twelve-month period.

(1) Views of Pacific

At the hearing Pacific stated that in accordance with the recently amended Board policy enunciated in the September report of excluding consideration of fringe area requirements, the fringe area estimates included in the application were withdrawn.

For permit commitments, in Table IV of Exhibit 5 presented at the hearing Pacific adopted the Board permit commitments as shown in the September report. The Board has assumed that this Table supersedes that part of Table IV in the application (Exhibit 4) relating to permit commitments which was prepared before the last two permits were issued. Permit commitments were expected to fall from 10,900 barrels per day in 1966 to 1,480 barrels per day in 1986, the year the longest permit terminates. Total commitments amounted to some 71 million barrels.

(2) Views of the Board

Having regard for evidence presented by Pacific concerning production from the Empress plant, and current performance, the Board has revised its estimate of the pattern of requirements for the existing Pacific permit. It now believes the full permit volume will be produced from 1966 onwards, as compared to its previous estimate of 1968 as the first year in which the permit volumes would be achieved. To conform with the overall permit limitation of 56 million barrels, permit commitments in 1980 have been reduced to compensate for the expected higher earlier production. The Canadian Hydrocarbons authorized commitments comprise the maximum amounts obtainable under its present permit.

Table B-5 shows the permit commitments which are anticipated to fall from 11,600 barrels per day in 1966 to 1,480 barrels per day in 1986, with overall requirements totalling some 71 million barrels, the last two figures being in agreement with those submitted by Pacific.

Summary

Table B-6 summarizes total requirements for Alberta propane as forecast by the Board and by Pacific. Since the projections of total permit requirements (see Table B-5) are virtually identical, the differences shown in the table between total requirements are attributable to variations in the estimates of Alberta requirements (see Table B-4).

TABLE B-1

FORECAST LPG DISTRIBUTORS REQUIREMENTS OF PROPANE IN ALBERTA 1966 - 1995

(BARRELS PER DAY)

Year	Pacific	Board
1966	4,500	5,000
1967	4,800	5,300
1968	5,100	5,700
1969	5,500	6,000
1970	5,800	6,400
1971	6,000	6,800
1972	6,300	7,300
1973	6,700	7,700
1974	7,000	8,200
1975	7,200	8,400
1976	7,400	9,000
1977	7,600	9,400
1978	7,900	10,000
1979	8,100	10,600
1980	8,300	10,700
1981	8,400	10,800
1982	8,600	11,000
1983	8,800	11,100
1984	8,900	11,300
1985	9,100	11,400
1986	9,300	11,700
1987	9,500	11,700
1988	9,700	11,900
1989	9,900	12,000
1990	10,100	12,200
1991	10,300	12,200
1992	10,500	12,400
1993	10,700	12,500
1994	10,900	12,700
1995	11,100	12,800
30-Year Requirements Millions of Barrels	89	107
Average Annual Cumulative Growth Rate (%)		
1966-1981	4.2	5.3
1981-1995	2.0	1.2
1966-1995	3.2	3.3

TABLE B-2

FORECAST MISCIBLE FLOOD REQUIREMENTS OF PROPANE IN ALBERTA 1966 - 1995

(BARRELS PER DAY)

Year	Pacific	Board*
1966	1,000	500
1967	1,000	500
1968	1,000	700
1969	2,000	700
1970	2,000	1,000
1971	2,000	1,000
1972	2,000	1,000
1973	2,000	1,000
1974	2,000	1,000
1975	2,000	1,000
1976	2,000	1,000
1977	2,000	1,000
1978	2,000	1,000
1979	2,000	1,000
1980	2,000	1,000
1981	2,000	1,000
1982	2,000	1,000
1983	2,000	1,000
1984	2,000	1,000
1985	2,000	1,000
1986	2,000	1,000
1987	2,000	1,000
1988	2,000	1,000
1989	2,000	1,000
1990	2,000	1,000
1991	2,000	1,000
1992	2,000	1,000
1993	2,000	1,000
1994	2,000	1,000
1995	2,000	1,000
30-Year Requirements Millions of Barrels	21	10

* Board forecast relates solely to non self-sustaining demand.

TABLE B-3

FORECAST PETROCHEMICAL REQUIREMENTS FOR PROPANE IN ALBERTA 1966 - 1995

(BARRELS PER DAY)

Year	Pacific	Board
1966	3,500	3,500
1967	3,600	3,600
1968	3,600	3,600
1969	3,700	3,700
1970	4,000	5,500
1971	4,600	6,100
1972	5,000	6,500
1973	5,400	6,900
1974	5,400	6,900
1975	5,400	6,900
1976	5,900	7,400
1977	6,200	7,700
1978	6,500	8,000
1979	6,600	8,300
1980	6,900	10,100
1981	7,300	10,400
1982	7,600	10,700
1983	8,000	11,000
1984	8,400	11,300
1985	8,800	11,600
1986	9,200	11,900
1987	9,600	12,200
1988	10,100	12,500
1989	10,700	12,800
1990	11,300	13,100
1991	11,900	13,400
1992	12,500	13,700
1993	13,100	14,000
1994	13,700	14,300
1995	14,200	14,600
30-Year Requirements Millions of Barrels	85	103
Average Annual Cumulative Growth Rate (%)		
1966-1981	5.0	7.5
1981-1995	4.9	2.4
1966-1995	4.9	5.1

TABLE B-4

FORECAST TOTAL REQUIREMENTS FOR PROPANE IN ALBERTA 1966 - 1995

(BARRELS PER DAY)

Year	Pacific	Board
1966	9,000	9,000
1967	9,400	9,400
1968	9,700	10,000
1969	11,200	10,400
1970	11,800	12,900
1971	12,600	13,900
1972	13,300	14,800
1973	14,100	15,600
1974	14,400	16,100
1975	14,600	16,300
1976	15,300	17,400
1977	15,800	18,100
1978	16,400	19,000
1979	16,700	19,900
1980	17,200	21,800
1981	17,700	22,200
1982	18,200	22,700
1983	18,800	23,100
1984	19,300	23,600
1985	19,900	24,000
1986	20,500	24,600
1987	21,100	24,900
1988	21,800	25,400
1989	22,600	25,800
1990	23,400	26,300
1991	24,200	26,600
1992	25,000	27,100
1993	25,800	27,500
1994	26,600	28,000
1995	27,300	28,400
30-Year Requirements Millions of Barrels	195	221
Average Annual Cumulative Growth Rate(%)		
1966-1981	4.6	6.2
1981-1995	3.2	1.8
1966-1995	3.9	4.0

TABLE B-5

ALBERTA PERMIT COMMITMENTS 1966 - 1995

(BARRELS PER DAY)

Year	Permit No.* CH 65-1 Canadian Hydrocarbons	Permit No. BA 65-1 British American	Permit No. PP 62-1		Total Commitments	
			Pacific	Board	Pacific	Board
1966	-	2,000	8,900	9,600	10,900	11,600
1967	2,130	2,000	9,500	9,600	13,630	13,730
1968	2,040	2,000	9,600	9,600	13,640	13,640
1969	2,040	2,000	9,600	9,600	13,640	13,640
1970	1,910	2,000	9,600	9,600	13,510	13,510
1971	1,770	2,000	9,600	9,600	13,370	13,370
1972	1,750	2,000	9,600	9,600	13,350	13,350
1973	1,610	2,000	9,600	9,600	13,210	13,210
1974	1,480	2,000	9,600	9,600	13,080	13,080
1975	1,480	1,750	9,600	9,600	12,830	12,830
1976	1,480	-	9,600	9,600	11,080	11,080
1977	1,480	-	9,600	9,600	11,080	11,080
1978	1,480	-	9,600	9,600	11,080	11,080
1979	1,480	-	9,600	9,600	11,080	11,080
1980	1,480	-	8,300	7,500	9,780	8,980
1981	1,480	-	-	-	1,480	1,480
1982	1,480	-	-	-	1,480	1,480
1983	1,480	-	-	-	1,480	1,480
1984	1,480	-	-	-	1,480	1,480
1985	1,480	-	-	-	1,480	1,480
1986	1,480	-	-	-	1,480	1,480
1987	-	-	-	-	-	-
1988	-	-	-	-	-	-
1989	-	-	-	-	-	-
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
30-Year Requirements Millions of Barrels	12	7	52	52	71	71

* Amounts represent authorized Permit volumes for the 12 months ending October 31 in each year, assuming that additional purchase contracts are made by the Permittee.

TABLE B-6

TOTAL ALBERTA AND PERMIT REQUIREMENTS 1966 - 1995

(BARRELS PER DAY)

Year	Pacific	Board
1966	19,900	20,600
1967	23,000	23,100
1968	23,300	23,600
1969	24,800	24,000
1970	25,300	26,400
1971	26,000	27,300
1972	26,700	28,200
1973	27,300	28,800
1974	27,500	29,200
1975	27,400	29,100
1976	26,400	28,500
1977	26,900	29,200
1978	27,500	30,100
1979	27,800	31,000
1980	27,000	30,800
1981	19,200	23,700
1982	19,700	24,200
1983	20,300	24,600
1984	20,800	25,100
1985	21,400	25,500
1986	22,000	26,100
1987	21,100	24,900
1988	21,800	25,400
1989	22,600	25,800
1990	23,400	26,300
1991	24,200	26,600
1992	25,000	27,100
1993	25,800	27,500
1994	26,600	28,000
1995	27,300	28,400
30-Year Requirements Millions of Barrels	266	292

APPENDIX C

THE MEETING OF THE PRESENT AND FUTURE REQUIREMENTS OF ALBERTA FOR PROPANE AND THE EXISTING PERMIT COMMITMENTS, AND THE RESULTING SURPLUS

As discussed in Section VI of the September report, the Board believes that there are three tests which must be satisfied in protecting for Alberta's propane requirements and the existing permit commitments. The first test involves comparison of the total propane reserves, including those associated with two years growth of gas reserves, to the total thirty-year requirements. The second test involves a year by year supply-demand balance for the period of the requested permit. The final test is a substitute for a year by year supply-demand balance for the remainder of the thirty-year period and involves a comparison of the propane reserves remaining at the end of the term of the requested permit to the total requirements for the remainder of the thirty-year period.

Total Balance

The Board has compared in Table C-1 the reserve and requirement estimates and the resulting surplus as presented by Pacific with its own estimate. The data included in the table were discussed in detail in Appendices A and B. The table includes the comparable surpluses that would result from existing plant facilities and including future facilities.

The table shows that the propane reserves from existing plant facilities as estimated by the Board are 81 million barrels greater than the total thirty-year requirements. If the reserves from future plant facilities are included, this surplus increases to 145 million barrels. The Board considers that greater weight should be placed on the latter figure. The Board's estimated surplus, including future plant facilities, of 145 million barrels, is lower than the more or less comparable figure of 177 million barrels estimated by Pacific for the case of moderate demand. This is primarily because of a lower estimate by Pacific of Alberta's thirty-year requirements. The Pacific estimated surplus reflecting maximum demand is much higher than the Board's because of both a lower estimate of the thirty-year requirements and a higher estimate of the total recoverable propane reserves. The latter occurs because of the inclusion of propane reserves from many small fields currently beyond economic reach.

Balance on a Year by Year Basis

Pacific included in its submission a Provincial supply-demand balance for propane for the period 1966 to 1994 inclusive. Details of the balance are presented for the period of the requested permit (1966 to 1989) as Table C-2. (In Table C-2 and all subsequent tables in this appendix all production and requirement figures have been rounded to the nearest 100 barrels). The table shows that, for the case of existing facilities plus two years growth of gas reserves, Pacific forecasts a propane surplus of 7,100 barrels per day in 1966 increasing to some 13,000 barrels per day by 1970. The surplus is then expected to remain approximately level until 1982 and thereafter to decline gradually to about 3,200 barrels per day by 1989. If future facilities are included, the surplus forecast by Pacific will increase from 7,100 barrels per day in 1966 to over 14,000 barrels per day in 1969. It will range from some 14,000 to 18,000 barrels per day until 1984 and then decline to some 6,400 barrels per day by 1989.

Table C-3 presents a supply-demand balance for the period 1966 to 1989 based on the Board's estimates of supply and demand as presented in Appendices A and B. The table shows that, for the case of propane production from existing facilities and two years growth of gas reserves, a surplus of about 9,000 barrels per day exists for the period 1966 to 1969 inclusive. The surplus then declines to the extent that a sizeable deficiency exists for the years 1984 to 1989. Including production from future processing facilities, the projected surplus is about 9,000 barrels per day for 1966 and 1967, increases to over 16,000 barrels per day in 1968 and then declines so that a small deficiency occurs for the years 1988 and 1989.

Table C-4 presents the surpluses as estimated by the Board and by Pacific. The figures have been taken from Tables C-2 and C-3 and show that the Board's forecast surplus is lower than that forecast by Pacific for both the case from existing facilities and the case including future facilities. This results from a higher production forecast and a lower demand forecast by Pacific.

Balance for Remainder of Thirty-Year Period

Table C-5 has been prepared as a substitute for a year by year supply-demand balance for the remainder of the thirty-year period. It is a comparison of the remaining propane reserves as of the end of 1989 (the end of the permit term requested by Pacific) to the total requirements of the Province for the remainder of the thirty-year period, 1990 to 1995 inclusive. The table includes the figures as estimated by the Board and by Pacific and for both studies presents two cases: one reflecting production from existing processing facilities and two years growth of gas reserves, and the other including future facilities.

The table shows that the remaining reserves as estimated by the Board at the end of the requested permit term will be 115 million barrels for the case of existing facilities or 119 million barrels including future facilities. It also shows that the total requirements for the remainder of the thirty-year period will be 60 million barrels. This results in a surplus of the then remaining reserves over the requirements for the remainder of the period of protection of 55 million barrels for the case of existing facilities or 59 million barrels including future facilities. The remaining surplus as estimated by Pacific is close to the Board's estimate from existing facilities, but it is almost twice as large (113 million barrels) including future facilities. This is primarily due to the inclusion of propane reserves from small gas fields now beyond economic reach in the estimate by Pacific of total reserves and from the production pattern assumed for these reserves by Pacific, which results in a substantial delay in the production of much of these reserves.

TABLE C-1

TOTAL PROPANE SURPLUS

(MILLIONS OF BARRELS)

	PACIFIC ESTIMATE			BOARD ESTIMATE	
	FROM EXISTING PROCESSING FACILITIES	INCLUDING FUTURE PROCESSING FACILITIES		FROM EXISTING PROCESSING FACILITIES	INCLUDING FUTURE PROCESSING FACILITIES
		MODERATE DEMAND	MAXIMUM DEMAND		
PROPANE RESERVES					
RESERVES FROM ESTABLISHED GAS RESERVES	357	383	431	330	394
RESERVES FROM TWO-YEARS GROWTH OF GAS RESERVES	60	60	60	43	43
TOTAL RECOVERABLE PROPANE RESERVES	417	443	491	373	437
PROPANE REQUIREMENTS					
THIRTY-YEAR ALBERTA REQUIREMENTS	195	195	195	221	221
EXISTING PERMIT COMMITMENTS	71	71	71	71	71
TOTAL RESERVES NEEDED TO MEET ALBERTA REQUIREMENTS AND PERMIT COMMITMENTS	266	266	266	292	292
SURPLUS	151	177	225	81	145

TABLE C-2

PROPANE SUPPLY-DEMAND BALANCE ESTIMATED BY PACIFIC

(BARRELS PER DAY)

	PRODUCTION			SURPLUS	
YEAR	FROM EXISTING PROCESSING FACILITIES AND TWO-YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	ALBERTA REQUIREMENTS AND PRESENT PERMIT COMMITMENTS	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
1966	27,000	27,000	19,900	7,100	7,100
1967	30,700	30,700	23,000	7,700	7,700
1968	34,700	35,200	23,300	11,400	11,900
1969	36,600	39,400	24,800	11,800	14,600
1970	38,300	41,000	25,300	13,000	15,700
1971	38,600	41,300	26,000	12,600	15,300
1972	38,800	41,500	26,700	12,100	14,800
1973	39,000	41,600	27,300	11,700	14,300
1974	39,300	41,800	27,500	11,800	14,300
1975	39,500	42,200	27,400	12,100	14,800
1976	39,300	42,000	26,400	12,900	15,600
1977	39,900	42,700	26,900	13,000	15,800
1978	39,200	42,200	27,500	11,700	14,700
1979	38,300	41,300	27,800	10,500	13,500
1980	35,600	38,800	27,000	8,600	11,800
1981	34,000	37,300	19,200	14,800	18,100
1982	32,300	35,700	19,700	12,600	16,000
1983	31,000	34,500	20,300	10,700	14,200
1984	30,000	33,500	20,800	9,200	12,700
1985	28,600	32,000	21,400	7,200	10,600
1986	27,800	31,200	22,000	5,800	9,200
1987	27,200	30,400	21,100	6,100	9,300
1988	26,400	29,600	21,800	4,600	7,800
1989	25,800	29,000	22,600	3,200	6,400
TOTAL (MILLIONS OF BARRELS)	299	322	210	89	112

TABLE C-3

PROPANE SUPPLY-DEMAND BALANCE ESTIMATED BY THE BOARD
(BARRELS PER DAY)

YEAR	PRODUCTION		ALBERTA REQUIREMENTS AND PRESENT PERMIT COMMITMENTS	SURPLUS	
	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES		FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
1966	29,200	29,200	20,600	8,600	8,600
1967	32,900	32,900	23,100	9,800	9,800
1968	33,800	40,400	23,600	10,200	16,800
1969	33,600	40,400	24,000	9,600	16,400
1970	33,300	40,600	26,400	6,900	14,200
1971	33,200	40,700	27,300	5,900	13,400
1972	33,800	41,400	28,200	5,600	13,200
1973	33,700	41,400	28,800	4,900	12,600
1974	33,700	41,400	29,200	4,500	12,200
1975	33,700	41,800	29,100	4,600	12,700
1976	33,600	41,700	28,500	5,100	13,200
1977	33,400	41,400	29,200	4,200	12,200
1978	33,400	41,400	30,100	3,300	11,300
1979	33,400	41,400	31,000	2,400	10,400
1980	32,000	40,000	30,800	1,200	9,200
1981	30,200	38,200	23,700	6,500	14,500
1982	27,600	35,600	24,200	3,400	11,400
1983	25,800	33,700	24,600	1,200	9,100
1984	23,500	31,400	25,100	- 1,600	6,300
1985	22,400	30,200	25,500	- 3,100	4,700
1986	21,400	28,800	26,100	- 4,700	2,700
1987	19,900	26,600	24,900	- 5,000	1,700
1988	19,400	25,300	25,400	- 6,000	- 100
1989	18,900	24,200	25,800	- 6,900	- 1,600
TOTAL (MILLIONS OF BARRELS)	258	318	232	26	86

TABLE C-4

YEAR BY YEAR PROPANE SURPLUS
(BARRELS PER DAY)

YEAR	PACIFIC ESTIMATE		BOARD ESTIMATE	
	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH
1966	7,100	7,100	8,600	8,600
1967	7,700	7,700	9,800	9,800
1968	11,400	11,900	10,200	16,800
1969	11,800	14,600	9,600	16,400
1970	13,000	15,700	6,900	14,200
1971	12,600	15,300	5,900	13,400
1972	12,100	14,800	5,600	13,200
1973	11,700	14,300	4,900	12,600
1974	11,800	14,300	4,500	12,200
1975	12,100	14,800	4,600	12,700
1976	12,900	15,600	5,100	13,200
1977	13,000	15,800	4,200	12,200
1978	11,700	14,700	3,300	11,300
1979	10,500	13,500	2,400	10,400
1980	8,600	11,800	1,200	9,200
1981	14,800	18,100	6,500	14,500
1982	12,600	16,000	3,400	11,400
1983	10,700	14,200	1,200	9,100
1984	9,200	12,700	- 1,600	6,300
1985	7,200	10,600	- 3,100	4,700
1986	5,800	9,200	- 4,700	2,700
1987	6,100	9,300	- 5,000	1,700
1988	4,600	7,800	- 6,000	- 100
1989	3,200	6,400	- 6,900	- 1,600
TOTAL (MILLIONS OF BARRELS)	89	112	26	86

TABLE C-5

PROPANE SURPLUS REMAINING AT THE END OF THE THIRTY-YEAR PERIOD

(MILLIONS OF BARRELS)

	PACIFIC ESTIMATE		BOARD ESTIMATE	
	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
Total Recoverable Propane Reserves	417	491	373	437
Production During Term of Requested Permits - To the End of 1989	299	322	258	318
Propane Reserves Remaining at the End of 1989	118	169	115	119
Total Requirements Including Existing Permit Commitments	266	266	292	292
Requirements During Term of Requested Permits - To the End of 1989	210	210	232	232
Requirements for Remainder of Thirty-Year Period (1990-1995)	56	56	60	60
SURPLUS	62	113	55	59

APPENDIX D

THE APPLICANT'S REQUEST FOR AUTHORIZATION FOR THE REMOVAL OF PROPANE AND THE SURPLUS WHICH WOULD RESULT IF THE REQUEST WAS APPROVED

Pacific is holder of Permit No. PP 62-1 authorizing the removal of propane and butanes from the Province over a period extending to May 14, 1981. Under it propane may be removed in a total quantity of 56 million barrels at a rate not to exceed 3.5 million barrels in any consecutive twelve-month period. It has requested amendments to the permit increasing the volumes of propane that may be removed from the Province to 5 million barrels in any consecutive twelve-month period and increasing the maximum quantity of gas which may be processed in the Empress plant from which the propane is to come to 547.5 billion cubic feet.

Because the propane production projected by the Board from the Empress plant is lower than the quantities requested by Pacific, the Board is not prepared to consider an amendment to the permit for the request in full. However, the Board is prepared to consider the Pacific application on the basis of the production projected by the Board from the Empress plant as set out in Table A-2 of this report. Table D-1 presents the Empress plant production as forecast by the Board, the quantities covered by the existing permit No. PP 62-1, and the resulting additional quantities which the Board is prepared to consider for removal from the Province by Pacific. Hereafter, the Board will refer to the additional propane available from the Empress plant, as set out in Table D-1, as "the adjusted Pacific request".

Total Balance

Table C-1 in Appendix C has shown that based on the Board's own study, the total available propane reserves, including future processing facilities, are some 145 million barrels greater than the thirty-year requirements of the Province and the existing permit commitments. If the adjusted Pacific request is provided for (29.4 million barrels from Table D-1), a surplus of some 116 million barrels still remains. If only the reserves associated with existing plant facilities are considered, this results in a reduction in the total surplus to some 52 million barrels.

Balance on a Year by Year Basis

Table D-2 has been prepared to determine if the adjusted Pacific request is surplus on a year by year basis to Alberta's requirements. The table has been based on the Board's estimates of requirements and production and presents two cases: one reflecting propane production from established gas reserves and existing recovery facilities plus two years growth of gas reserves, and the other including production from future processing facilities. The table covers the years 1966 to 1989 inclusive, which are set out in column 1. Columns 2 and 3 have been taken from Table C-3 of this report, and give the propane surplus to Alberta's requirements and the existing permit commitments as projected by the Board for the two above mentioned cases. Column 4 shows the adjusted Pacific request and columns 5 and 6 are the resulting surplus for each case.

The table shows that for the case of existing facilities plus two years growth of gas reserves, the adjusted Pacific request can be satisfied and a surplus of some 8,000 barrels per day will exist in the early years of the period under study. The surplus will gradually decline and a deficit is predicted for the years 1980 to 1989 inclusive. The deficiency will be over 10,000 barrels per day in the later years of the period under study. If production from future facilities is included, a surplus results for the period 1966 to 1983 inclusive. The surplus will increase from some 8,000 barrels per day in 1966 to about 15,000 barrels per day in 1968, and thereafter will decline to some 900 barrels per day by 1983. A deficiency of some 1,200 barrels per day will occur in 1984 increasing to over 5,000 barrels per day by 1989. The Board places greater weight on the case including future facilities.

Balance for Remainder of Thirty-year Period

Table D-3 is a comparison of the remaining propane reserves as of the end of 1989 (the end of the permit term requested by Pacific) with the total requirements of the Province for the remainder of the thirty-year period, 1990 to 1995 inclusive. The table presents two cases: one reflecting production from existing processing facilities and two years growth of gas reserves, and the other including future facilities.

The table shows that the remaining reserves at the end of the requested permit term will be 115 million barrels for the case of existing facilities or 119 million barrels including future facilities. It also shows that the total requirements for the remainder of the thirty-year period will be 60 million barrels. This results in a surplus of the then remaining reserves over the requirements for the remainder of the period of protection of 55 million barrels for the case of existing facilities or 59 million barrels including future facilities.

On the basis of the three tests, the Board does not believe that the adjusted Pacific request should be approved in its entirety. Based on the balance shown in Table D-2, the entire Empress plant production as projected by the Board will be surplus to Alberta's requirements and the existing permit commitments through 1983. Thereafter, a portion of the Empress plant production may be required to satisfy Alberta's requirements. The Board is prepared with the approval of the Lieutenant Governor in Council to permit the removal from the Province of those quantities of propane which are surplus to Alberta's requirements up to the projected production at the Empress plant.

Table D-4 presents the additional quantities and the total quantities of propane that could be removed from the Province under such a permit. Column 2 of the table is the propane covered by the existing permit. Column 3 is that portion of the additional propane the Board estimates will be produced at the Empress plant which is surplus to Alberta's requirements. Column 4 is the sum of columns 2 and 3.

Should the removal from the Province of the quantities referred to in column 4 of Table D-4 be authorized, the impact on the year by year balance shown in column 6 of Table D-2 would be to reduce the deficiency in the years 1984 to 1987 to a balanced position. The impact on Table D-3 would be to reduce the surplus of the remaining reserves over the requirements for the remainder of the thirty-year period from 55 or 59 million barrels to 50 or 58 million barrels.

TABLE D-1

ADDITIONAL PROPANE AVAILABLE TO PACIFIC FROM EMPRESS PLANT BASED ON BOARD FORECAST

(BARRELS PER DAY)

YEAR	EMPRESS PLANT PRODUCTION	EXISTING PERMIT COMMITMENT	ADDITIONAL PROPANE AVAILABLE
1966	9,800	9,600	200
1967	10,300	9,600	700
1968	11,000	9,600	1,400
1969	11,000	9,600	1,400
1970	11,000	9,600	1,400
1971	11,000	9,600	1,400
1972	11,000	9,600	1,400
1973	11,000	9,600	1,400
1974	11,000	9,600	1,400
1975	11,000	9,600	1,400
1976	11,000	9,600	1,400
1977	11,000	9,600	1,400
1978	11,000	9,600	1,400
1979	11,000	9,600	1,400
1980	10,200	7,500	2,700
1981	9,600		9,600
1982	8,900		8,900
1983	8,200		8,200
1984	7,500		7,500
1985	6,800		6,800
1986	6,000		6,000
1987	5,200		5,200
1988	4,400		4,400
1989	3,600		3,600
TOTAL (THOUSANDS OF BARRELS)		51,794	29,419

TABLE D-2

PROPANE SURPLUS IF ADJUSTED PACIFIC REQUEST WAS GRANTED BASED ON BOARD FORECAST

(BARRELS PER DAY)

(1) YEAR	(2) SURPLUS PRIOR TO CONSIDERING APPLICATION[(1)] FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	(3) SURPLUS PRIOR TO CONSIDERING APPLICATION[(1)] INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	(4) ADJUSTED PACIFIC REQUEST	(5) REMAINING SURPLUS FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	(6) REMAINING SURPLUS INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
1966	8,600	8,600	200	8,400	8,400
1967	9,800	9,800	700	9,100	9,100
1968	10,200	16,800	1,400	8,800	15,400
1969	9,600	16,400	1,400	8,200	15,000
1970	6,900	14,200	1,400	5,500	12,800
1971	5,900	13,400	1,400	4,500	12,000
1972	5,600	13,200	1,400	4,200	11,800
1973	4,900	12,600	1,400	3,500	11,200
1974	4,500	12,200	1,400	3,100	10,800
1975	4,600	12,700	1,400	3,200	11,300
1976	5,100	13,200	1,400	3,700	11,800
1977	4,200	12,200	1,400	2,800	10,800
1978	3,300	11,300	1,400	1,900	9,900
1979	2,400	10,400	1,400	1,000	9,000
1980	1,200	9,200	2,700	- 1,500	6,500
1981	6,500	14,500	9,600	- 3,100	4,900
1982	3,400	11,400	8,900	- 5,500	2,500
1983	1,200	9,100	8,200	- 7,000	900
1984	- 1,600	6,300	7,500	- 9,100	- 1,200
1985	- 3,100	4,700	6,800	- 9,900	- 2,100
1986	- 4,700	2,700	6,000	-10,700	- 3,300
1987	- 5,000	1,700	5,200	-10,200	- 3,500
1988	- 6,000	- 100	4,400	-10,400	- 4,500
1989	- 6,900	- 1,600	3,600	-10,500	- 5,200

(1) From Table C-3

TABLE D-3

PROPANE SURPLUS REMAINING AT THE END OF THE THIRTY-YEAR PERIOD BASED ON BOARD FORECAST

(MILLIONS OF BARRELS)

	FROM EXISTING PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES		INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	
Total Recoverable Propane Reserves	373		437	
Production during term of Requested Permit - To the end of 1989	258		318	
Propane Reserves Remaining at the End of 1989		115		119
Total Requirements Including Existing and Requested Permit Commitments	321		321	
Requirements During Term of Requested Permits - To the end of 1989	261		261	
Requirements for Remainder of Thirty-year Period (1990-1995)		60		60
SURPLUS		55		59

TABLE D-4

PROPANE AVAILABLE TO PACIFIC BASED ON BOARD FORECAST

(BARRELS PER DAY)

YEAR	EXISTING PERMIT	ADDITIONAL PROPANE AVAILABLE	TOTAL PROPANE AVAILABLE
1966	9,600	200	9,800
1967	9,600	700	10,300
1968	9,600	1,400	11,000
1969	9,600	1,400	11,000
1970	9,600	1,400	11,000
1971	9,600	1,400	11,000
1972	9,600	1,400	11,000
1973	9,600	1,400	11,000
1974	9,600	1,400	11,000
1975	9,600	1,400	11,000
1976	9,600	1,400	11,000
1977	9,600	1,400	11,000
1978	9,600	1,400	11,000
1979	9,600	1,400	11,000
1980	7,500	2,700	10,200
1981		9,600	9,600
1982		8,900	8,900
1983		8,200	8,200
1984		6,300	6,300
1985		4,700	4,700
1986		2,700	2,700
1987		1,700	1,700
1988		*	*
1989		*	*
TOTAL (THOUSANDS OF BARRELS)	51,794	22,812	74,606

* EMPRESS PLANT PRODUCTION NOT SURPLUS TO ALBERTA'S REQUIREMENTS.

APPENDIX E

IN THE MATTER of The Gas Resources
Preservation Act, 1956, being
Chapter 19 of the Statutes of
Alberta, 1956; and

IN THE MATTER of a Permit to Pacific
Petroleums Ltd. authorizing the
removal of propane from the Province.

PERMIT NO. PP 66-2

WHEREAS Pacific Petroleums Ltd. (hereinafter called "the Permittee") is removing propane from the Province under the authority of Permit No. PP 62-1; and

WHEREAS the Permittee has applied to the Oil and Gas Conservation Board for an order varying and amending several of the provisions of the said Permit; and

WHEREAS the Board, upon inquiry into and hearing of the application, has found that the Permittee is a person who acquires property in propane within the Province and who has entered into a contract to acquire property in propane within the Province and who proposes to remove propane, or cause it to be removed, from the Province, and that the provisions of The Gas Resources Preservation Act, 1956, affecting the application have been complied with; and

WHEREAS the Board is of the opinion that, with the variations and amendments to be made to the permit the Permittee now holds, it is proper and desirable to revise and consolidate the permit; and

WHEREAS the Board is of the opinion that the granting of this permit for the removal of propane from the Province is in the public interest, having regard to the present and future needs of persons within the Province, and the established reserves and trends in growth and discovery of reserves of gas or propane in the Province; and

WHEREAS the Lieutenant Governor in Council has given his approval by Order in Council numbered , and dated

THEREFORE, the Oil and Gas Conservation Board pursuant to the provisions of The Gas Resources Preservation Act, 1956, hereby grants a Permit to Pacific Petroleums Ltd., and hereby authorizes the removal of propane from the Province, subject to the regulations and orders made pursuant to the provisions of the said Act and to the terms and conditions prescribed in this Permit, as follows:

1. Subject to the conformity by the Permittee with the terms and conditions hereof, this Permit shall be operative for a term commencing on the date hereof and ending on October 31, 1987.

2. The quantity of propane that may be removed from the Province pursuant to this Permit shall not exceed in any of the following twelve-month periods the maximum quantity prescribed for that period as follows:

Twelve-month Period	Maximum Quantity
November 1, 1965 to October 31, 1966	3,580,000 barrels (which shall include propane removed during the period under Permit No. PP 62-1)
November 1, 1966 to October 31, 1967	3,760,000 barrels
November 1, 1967 to October 31, 1968	4,020,000 barrels
November 1, 1968 to October 31, 1969	4,020,000 barrels

November 1, 1969 to October 31, 1970	4,020,000 barrels
November 1, 1970 to October 31, 1971	4,020,000 barrels
November 1, 1971 to October 31, 1972	4,020,000 barrels
November 1, 1972 to October 31, 1973	4,020,000 barrels
November 1, 1973 to October 31, 1974	4,020,000 barrels
November 1, 1974 to October 31, 1975	4,020,000 barrels
November 1, 1975 to October 31, 1976	4,020,000 barrels
November 1, 1976 to October 31, 1977	4,020,000 barrels
November 1, 1977 to October 31, 1978	4,020,000 barrels
November 1, 1978 to October 31, 1979	4,020,000 barrels
November 1, 1979 to October 31, 1980	3,720,000 barrels
November 1, 1980 to October 31, 1981	3,500,000 barrels
November 1, 1981 to October 31, 1982	3,250,000 barrels
November 1, 1982 to October 31, 1983	2,990,000 barrels
November 1, 1983 to October 31, 1984	2,300,000 barrels
November 1, 1984 to October 31, 1985	1,720,000 barrels
November 1, 1985 to October 31, 1986	986,000 barrels
November 1, 1986 to October 31, 1987	620,000 barrels

3. The Permittee, for the purpose of this Permit, may remove from the Province, under the authority of this Permit, only propane obtained from the processing in a gas processing plant located in Section 11, Township 20, Range 1, West of the 4th Meridian (hereinafter referred to as "the Empress plant") in any consecutive twelve-month period commencing on November 1st, of up to 550 billion cubic feet of gas owned by Trans-Canada Pipe Lines Limited being transported by The Alberta Gas Trunk Line Company Limited.

4. (1) All propane removed from the Province pursuant to this Permit shall be measured by or on behalf of the Permittee at the Empress plant in a manner approved by the Board.

(2) The measurements required by this clause shall be reported monthly to the Board in a manner approved by the Board.

5. The Permittee shall supply propane at a reasonable price to any community or consumer within the Province that is willing to take delivery of propane at the Empress plant and that, in the opinion of the Board, can reasonably be supplied by the Permittee.

6. If any community or consumer is willing to take delivery of propane pursuant to clause 5 of these terms and conditions, and agreement on the price to be paid for the propane cannot be reached, the price to be paid shall be determined by the Public Utilities Board on the application of an interested party.

7. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, competent regulation, order or direction governing the production, conservation, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of propane within the Province.

8. Permit No. PP 62-1 is rescinded.

MADE at the City of Calgary, in the Province of Alberta, this day of A.D. 1966.

OIL AND GAS CONSERVATION BOARD

G. W. Govier

Chairman.

[illegible]

[illegible] for the [illegible]

[illegible] examined [illegible]

[illegible] the literature [illegible]

[illegible] the provisions [illegible]

[illegible] of the Act, [illegible]

[illegible] the production [illegible]

[illegible] competitive [illegible]

[illegible] of student [illegible]

[illegible] be provided [illegible]

[illegible]